ABSTRACT

This invention is a method for forming a chemical conversion coating on ferrous metal substrates, the chemical solutions used in the coating and the articles coated thereby. By modifying and combining the features of two existing, but heretofore unrelated, coating technologies, a hybrid conversion coating is formed. Specifically, a molecular iron/oxygen-enriched intermediate coating, such as a dicarboxylate or phosphate, is applied to a ferrous substrate by a first oxidation. The intermediate coating pre-conditions the substrate to form a surface rich in molecular iron and oxygen in a form easily accessible for further reaction. This oxidation procedure is followed by a coloring procedure using a heated (about 120 - 220 F) oxidizing solution containing alkali metal hydroxide, alkali metal nitrate, alkali metal nitrite or mixtures thereof, which reacts with the iron and oxygen enriched intermediate coating to form magnetite (Fe_3O_4). The result is the formation of a brown or black finish under much more favorable, milder and safer conditions than previously seen with conventional caustic blackening processes, by virtue of the chemical reaction between the intermediate coating and the second oxidation solution. When sealed with an appropriate rust preventative topcoat, the final result is an ultra-thin, attractive and protective finish applied through simple immersion techniques. The finish is a final protective coating on a fabricated metal article and also affords a degree of lubricity to aid assembly, break-in of sliding surfaces or provide anti-galling protection. The finish also provides an adherent base for paint finishes.

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